

# **Exhibit 34**



US010033992B1

(12) United States Patent  
McGowan(10) Patent No.: US 10,033,992 B1  
(45) Date of Patent: Jul. 24, 2018(54) GENERATING A 3D VIDEO OF AN EVENT  
USING CROWD SOURCED DATA

(71) Applicant: Google Inc., Mountain View, CA (US)

(72) Inventor: John McGowan, Broomfield, CO (US)

(73) Assignee: Google LLC, Mountain View, CA (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 226 days.

(21) Appl. No.: 14/481,120

(22) Filed: Sep. 9, 2014

## (51) Int. Cl.

H04N 7/48 (2006.01)

H04N 7/18 (2006.01)

G09G 5/00 (2006.01)

G09G 5/02 (2006.01)

H04N 13/04 (2006.01)

## (52) U.S. Cl.

CPC ..... H04N 13/0456 (2013.01)

## (58) Field of Classification Search

CPC ..... H04N 13/0456; H04N 7/181; H04N 7/18

See application file for complete search history.

## (56) References Cited

## U.S. PATENT DOCUMENTS

- 5,615,318 A \* 3/1997 Matsuura ..... A41H 3/007  
345/419
- 6,084,979 A 7/2000 Kanade et al.
- 6,154,251 A 11/2000 Taylor
- 6,535,226 B1 3/2003 Sorokin et al.
- 6,556,201 B1 \* 4/2003 Maehara ..... G06T 15/205  
345/427
- 6,791,542 B2 9/2004 Matusik et al.
- 6,983,064 B2 1/2006 Song

7,035,453 B2 4/2006 Liu  
7,075,661 B2 \* 7/2006 Petty ..... G01S 17/875  
356/6037,106,361 B2 9/2006 Kanade et al.  
7,538,774 B2 \* 5/2009 Kunita ..... G06T 7/593  
345/5817,583,815 B2 9/2009 Zhang et al.  
(Continued)

## FOREIGN PATENT DOCUMENTS

WO WO 2000/58913 10/2000

## OTHER PUBLICATIONS

USPTO Office Action for U.S. Appl. No. 13/835,887, dated Jan. 30, 2014.

(Continued)

Primary Examiner — Sath V Perungavoor

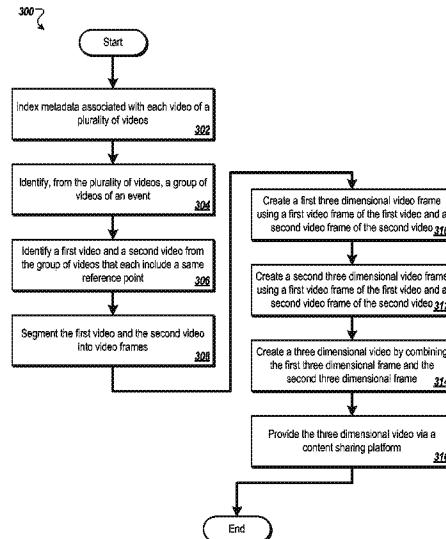
Assistant Examiner — Philip Dang

(74) Attorney, Agent, or Firm — Lowenstein Sandler LLP

## (57) ABSTRACT

Generating 3D content is described. A method includes identifying a group of videos of an event. The method includes detecting a first reference point in a first video and a second video from the group of videos. The method also includes creating a first three dimensional video frame based on a first video frame of the first video and a second video frame of the second video using the first reference point. The method further includes creating a second three dimensional video frame based on a third video frame of the first video and a fourth video frame of the second video using a second reference point. The method includes creating a three dimensional video by combining the first three dimensional frame and the second three dimensional frame in a sequential order based on respective timestamps of the first three dimensional frame and the second three dimensional frame.

19 Claims, 5 Drawing Sheets



**US 10,033,992 B1**

Page 2

(56)	<b>References Cited</b>						
U.S. PATENT DOCUMENTS							
7,594,177	B2 *	9/2009	Jojic .....	G06F 17/30852 715/720	2013/0314510	A1 *	11/2013 Endo ..... G03B 35/08 348/49
7,595,816	B1	9/2009	Enright et al.		2014/0028780	A1 *	1/2014 Croen ..... H04N 21/42203 348/14.03
7,884,848	B2	2/2011	Ginther		2014/0028806	A1 *	1/2014 Endo ..... H04N 13/0217 348/49
7,903,048	B2 *	3/2011	Yanagisawa .....	G01C 21/36 345/7	2014/0100900	A1 *	4/2014 Abhyanker ..... H04L 67/18 705/5
7,991,778	B2 *	8/2011	Hull .....	G06K 9/00442 707/741	2014/0136414	A1 *	5/2014 Abhyanker ..... G06Q 50/28 705/44
8,060,908	B2	11/2011	Bountour et al.		2014/0143061	A1 *	5/2014 Abhyanker ..... G06Q 50/01 705/14.58
8,072,503	B2 *	12/2011	Tischer .....	H04N 5/235 348/47	2014/0180914	A1 *	6/2014 Abhyanker ..... G01C 1/00 705/39
8,125,481	B2	2/2012	Gossweiler, III et al.		2014/0186010	A1 *	7/2014 Guckenberger .... G11B 27/031 386/248
8,204,229	B2	6/2012	Arcas et al.		2014/0198954	A1 *	7/2014 Bulzacki ..... G06K 9/00342 382/103
8,270,704	B2	9/2012	Kim et al.		2014/0237365	A1 *	8/2014 Oberbrunner ..... G11B 27/34 715/722
8,462,198	B2	6/2013	Lin et al.		2014/0240363	A1 *	8/2014 Hong ..... G06F 3/012 345/684
8,508,580	B2 *	8/2013	McNameer .....	H04N 13/0221 348/43			
8,564,661	B2 *	10/2013	Lipton .....	G08B 13/19608 348/143			
8,570,376	B1 *	10/2013	Sharma .....	H04N 7/18 348/159			
8,633,968	B2 *	1/2014	Kennedy .....	H04N 13/0235 348/43			
2005/0088515	A1	4/2005	Geng				
2011/0050929	A1	3/2011	Lee et al.				
2011/0255775	A1 *	10/2011	McNameer .....	H04N 13/0221 382/154			
2012/0106801	A1 *	5/2012	Jackson .....	G08G 1/0175 382/105			
2012/0113111	A1 *	5/2012	Shiki .....	A61B 8/08 345/419			
2013/0010079	A1 *	1/2013	Zhang .....	H04N 13/0207 348/47			
2013/0176438	A1 *	7/2013	Mate .....	H04N 7/181 348/157			
2013/0278501	A1 *	10/2013	Bulzacki .....	G06F 3/017 345/157			
2013/0278631	A1 *	10/2013	Border .....	G02B 27/017 345/633			
2013/0278727	A1	10/2013	Tamier et al.				

**OTHER PUBLICATIONS**

USPTO Office Action for U.S. Appl. No. 13/835,887, dated Jul. 31, 2013.

Wilburn, et al., "High Performance Imaging Using Large Camera Arrays", ACM Transactions on Graphics 24.3 (2005): 765-776. (Retrieved on Nov. 14, 2012 from: [http://graphics.stanford.edu/papers/CameraArray/CameraArray\\_Sig05.pdf](http://graphics.stanford.edu/papers/CameraArray/CameraArray_Sig05.pdf) ).

David Shaman, "SceneNet turns mobile video clips into (almost) live, 3D events," SceneNet, May 12, 2014.

Puneet Jain et al., "Focus: Clustering Crowdsourced Videos by Line-of-Sight," SenSys '13, Nov. 11-15, 2013.

Guanfeng Want et al., "Active key frame selection for 3D model reconstruction from crowdsourced geo-tagged videos," 15th IEEE International Conference on Multimedia & Expo (ICME 2014), 2014.

Shamah, D. (May 12, 2014). SceneNet turns mobile video clips into (almost) live, 3D events. Retrieved from [www.timesofisrael.com](http://www.timesofisrael.com) on Feb. 13, 2017. 2 pages.

\* cited by examiner